GAZELLE G9803
Duct Air Leakage Tester

Be sure to read this manual thoroughly before using the instrument.
Please keepthis manual as a service reference.

Component List

Standard:

ITEM	QTY
Duct Air Leakage Tester	1
Flow Grid	1
Low flow nozzle	1
06 Silicone tube (white)	1
Duct connection hose	1
Power cord	1
Container	1
06 Silicon tube (blue)	1
06 Silicon tube (red)	1
Calibration certificate	1
Instruction Manual	1

Optional Extras:

ITEM	QTY
Smoke pellet kits	
Dust proof cover	

Symbols for warning mentioned in this manual are defined below:

Symbols classifications

Danger: To Prevent Serious Injury or Death

Warnings in this classification indicate a danger that may result in serious injury or death if not observed.

Caution: To Prevent Damage to the Product

Warnings in this classification indicate a risk of damage to the product that may void the product warranty ifnot observed.

Description of Symbols

△ This symbol indicates a condition that requires caution (including danger). The subject of each caution isillustrated inside the triangle.

⃠ This symbol indicates a prohibition. Do not take the prohibited action shown inside or near this symbol.

● This symbol indicates a mandatory action. A specific action is given near the symbol.

⚠ ARNING	
 Heat forbidden	○ Never bring the fabric hood near flammable gas or heat source. ··· Otherwise, the heat may cause a fire or explosion.
 D ply prohibition	○ Do not disassembly or refit the instrument. ··· Otherwise, it may cause the electric shock or a fire.
 U erly	○ Use properly under the instruction manual. ··· Otherwise, it may cause sensor damaged or an electric shock even a fire.
 Using properly	○ If abnormal smells, noises or smoke occur, or if liquid enters the instrument, pull outthe AC adapter and remove the batteries immediately. Then send it to themaintenance Dept. of Ke Lan Lion for after service. ··· Or, there is possible of an electric shock or a fire or instrument malfunction.
 Forbidden	○ Do not expose the fabric hood, base and the instrument to water or rain. ··· Otherwise, may cause an electric shock, a fire and person injure.

⚠ CAUTION	
 Using properly	○ Always unplug when the instrument not in use. ··· Failure to do so may cause an electric shock, a fire or circuit damage.
	○ Do not use orleave the instrument in a hightemperature, high humidity or dusty environment. Do not leave the instrument under direct sunlight. ··· Otherwise, the instrument may not function properlyout of the specified operating conditions or the insidecomponents damaged.

 **Forbidden**	○ Never dropping the unit or place heavy objects on it. ⋯ It may cause damage or malfunction to the instrument.
	○ The load weight limit for the ring should be under200kgs. ⋯ Otherwise, It may cause damage or malfunction to theinstrument.

1. Introduction

Duct Air Leakage Tester is mainly used for HVAC duct air leakage testing. Testing can be in sections and the overall pipeline after whole system installation to make the HVAC system effective and avoiding energy waste. Model 6900 can judge the whether the duct seal is qualified based on and compliant with the corresponding accreditation standard. Touch screen with LCD color display and friendly Man-machine interface will make operation convenient and easier.

1.1. Product features

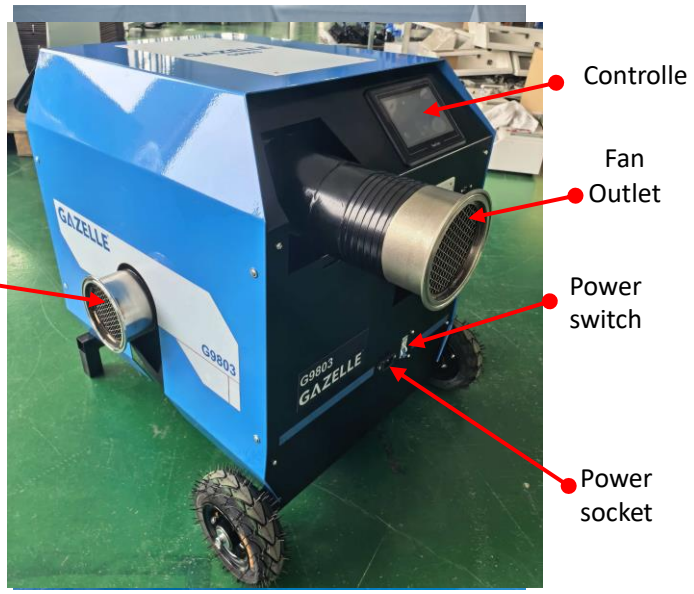
- Duct air leakage testing under positive or negative flow.
- Compliant with the following standards:EN1507:2006, EN12237:2003, Eurovent 2/2, DW/143, SMACNA Standard,AABC Standard, GB50243 - 2003/2016.
- Wide air flow testing range, two measuring tools ensure the test accuracy.
- Accreditation result will determine whether the duct sealing qualified.
- Real time display the leakage, testing pressure, temperature and atmosphere.
- 1000 groups data storage, review and delete.
- 5 inches LCD touch screen for easy operation.
- Simple construction and convenient installation.

1.2 Main Specifications

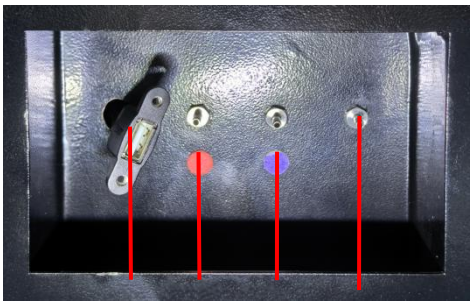
model ：		V40 max
rate of flow	scope	Matrix: 36~640 m3/h nozzle: 4~36 m3/h
	accuracy	The reading is ±2.5%±0.1 m3/h
	resolution ratio	0.01 m3/h
static pressure	scope	±2500 Pa
	accuracy	Readings are 1%±1Pa
	resolution ratio	0.1 Pa
temperature	scope	0～60 ℃
	accuracy	±0.5℃
	resolution ratio	0.1 ℃
atmos	scope	70～130kPa
	accuracy	Readings are ±2%
	resolution ratio	0.1kPa
source	6900-0E	100-120V,1 Phase,50/60Hz,16A
	6900-1E	200-240V,1 Phase,50/60Hz,10A
weight		The net weight is about 72kg
size		98*63*63cm
memory		Up to 1000 measurements

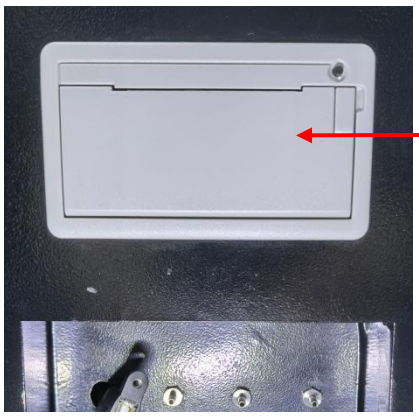
2 Appearance and structure

2.1 Overall structure



2.2 Control box structure





3 .Instrument installation

During use, either a nozzle or a matrix tool can be selected for testing based on the range of airflow to be measured. This instrument is suitable for air conditioning duct blowing and exhaust systems . Generally, nozzle tools are used for low-flow testing, while matrix tools are used for high -flow testing.

3.1 .Pipeline connection under test

Preparations before pipeline qualification:

(1) Refer to Appendix 1, Pipeline Qualification Standards, to determine the qualification standards, sealing level, and test pressure;

(2) Temporarily seal all joints of the pipeline to be tested, leaving only one joint connected to the testing machine. Calculate the surface area of the pipeline to be tested, within the input range of the testing machine;

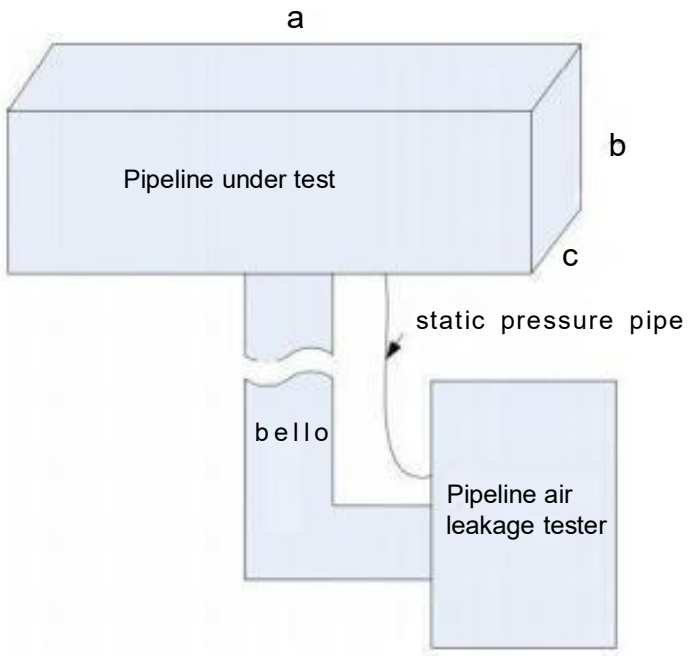
Connect the pipe under test to the testing machine:

(1) Place the testing machine near the pipeline under test to minimize the length of the corrugated pipe and r educe pressure loss .

(2) Connect one end of the corrugated pipe assembly to the testing machine and lock it with a cam-locking connector. Connect the other end to the pipeline under test via a flange. The user should install it according to the actual condition of the pipeline under test.

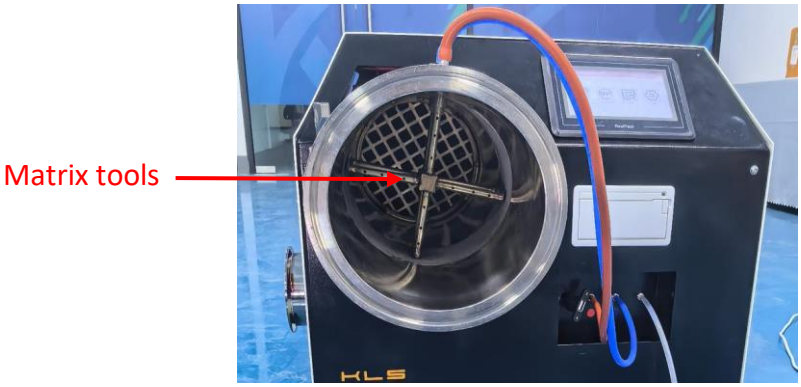
(3) If there is a static pressure tap on the pipeline under test, connect the static pressure pipe to the tap. Otherwise, drill φ6 holes in the pipeline, insert the static pressure pipe into the pipeline, and seal the area around the static pressure pipe. Connect the other end of the static pressure pipe to the control box.

(4) Calculation of duct surface area: Surface area S = (ab + bc + ca) × 2



3.2. High leakage test

High leakage testing was performed using a matrix tool. The matrix tool was installed at the fan outlet, and the cam locking connector was tightened. The pressure taps on the matrix tool were connected to the airflow differential pressure interface of the control box, with the connections made according to color.



Note: When locking the cam locking joint, apply force to the cam locking arm simultaneously.

1. Positive pressure test of the pipeline: Connect the cam locking connector of the bellows to the matrix air outlet and lock it.

2. Negative pressure test of the pipeline: Connect the cam locking connector of the bellows to the fan inlet and lock it.

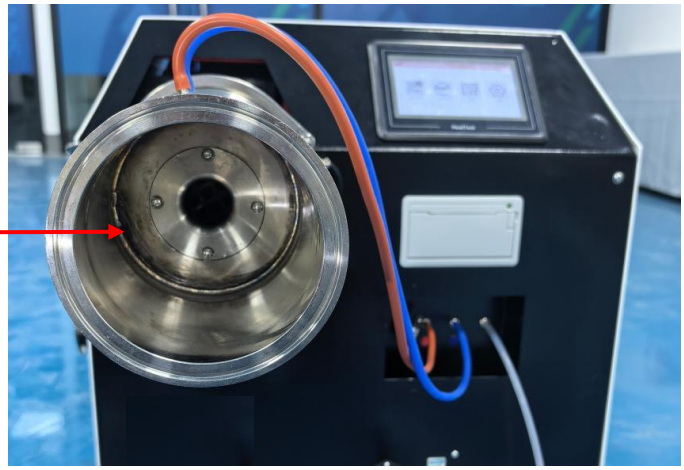
Cam lock Adaptor in locked status.

High flow Duct testing under positive pressure

High flow Duct testing under Negative pressure

3.3 Low leakage test

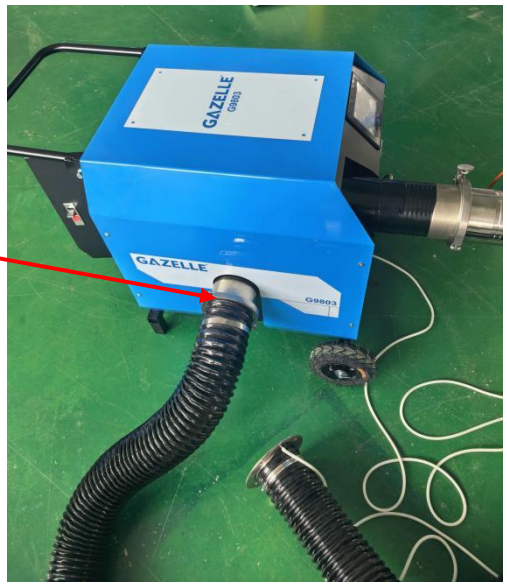
The low-flow test uses a nozzle tool to install the nozzle element at the fan outlet and lock the cam locking connector. The pressure tap on the nozzle tool is connected to the airflow differential pressure interface of the control box, according to the color coding.



1. Positive pressure test of the pipeline: Connect the cam locking connector of the bellows to the nozzle outlet and tighten it.

2. Negative pressure test of the pipeline: Connect the cam locking connector of the bellows to the fan inlet and tighten it.

High flow Duct testing under positive pressure



High flow Duct testing under Negative pressure

4.How to use

4.1.Power on the instrument

1. Connect to power：This instrumen is powered by AC powe. Connect the power cord and turn on the power protector. Check that the connection cable at the rear of the control box is secure.

2 . Control box powered on：After connecting the control box to the power supply, turn on the control switch to power on the instrument .

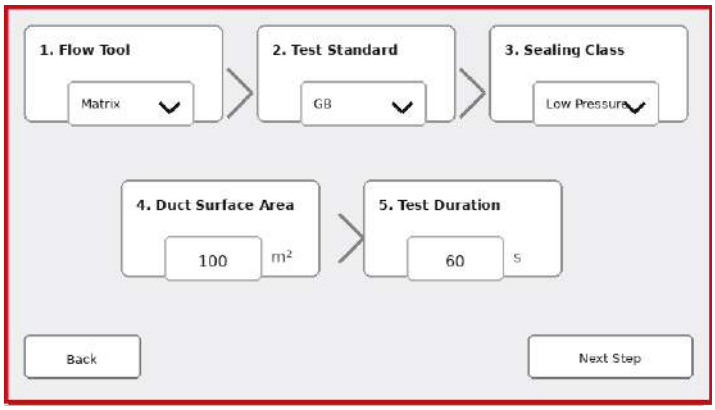
3. Main Interface Introduction

Authenticati on Test	The evaluation interface allows users to set evaluation criteria for pipe sealing, conduct tests according to relevant standards, and save the data.
General Test	The testing interface allows for the measurement of airflow, pressure, temperature, and atmospheric pressure.
Settings	In the settings interface, you can configure parameters such as date, time, test mode, and unit.
Data	The data browsing/deletion interface allows you to browse or delete data.
USB	The export interface allows you to export stored data to a USB drive.
About	Regarding the interface, this section introduces the instrument's basic performance parameters.

4.2.Identification Interface

The evaluation interface requires setting parameters such as tools, standards, sealing rating, pipe surface area, and test time to control the static pressure within the pipe. Pipe evaluation can only proceed once the static pressure meets the standard requirements. After evaluation, the results are output and can be saved or measured again.

[Click the "Identification Test" button on the main interface to enter]



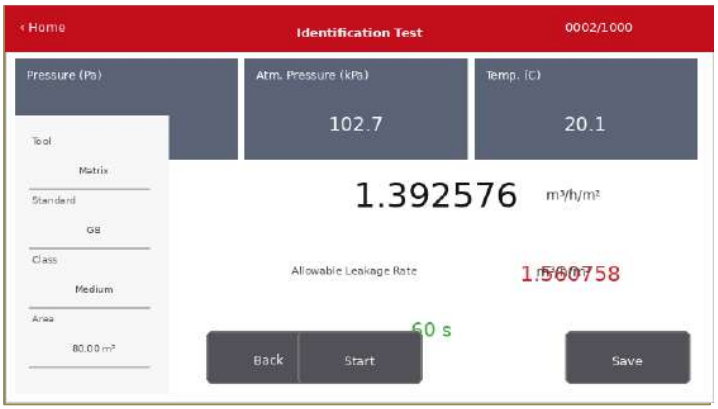
4.2.1 Set test parameters

1. Select the traffic tool
2. Select test criteria
3. Select or enter the sealing grade
4. Input the pipe surface area
5. Enter the test time
6. Next steps

4.2.2 Start adjusting the fan

1. Start the fan
   Click "Start"
2. Regulating fan (pipeline static pressure)
   a. Click "Pressurize" or "Depressurize"
   b. slide control
3. Enter the test

Note: Before starting the fan, check that the pipeline is smooth and there is no folding phenomenon!



4.2.3 Enter the test

The interface includes:

Current result count
Real-time value display area
Set the parameter display area
Results show the area
Operation buttons

1. Click "Start" and test according to the set parameters
2. Wait for the test time to end (the result cannot be saved if it is stopped in the middle)
3. You can choose to save the test results or click "Start" to retest

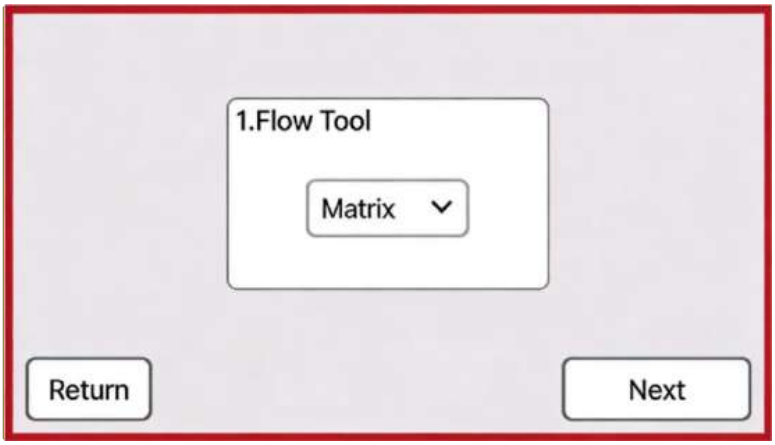
The "+" and "-" in the pressure display box can also adjust the wind force (pipeline pressure)
Click the icon in the upper right corner to enter the results interface (see the results interface section for details)

4.3 General test

[Click the "Normal Test" button on the main interface to enter]

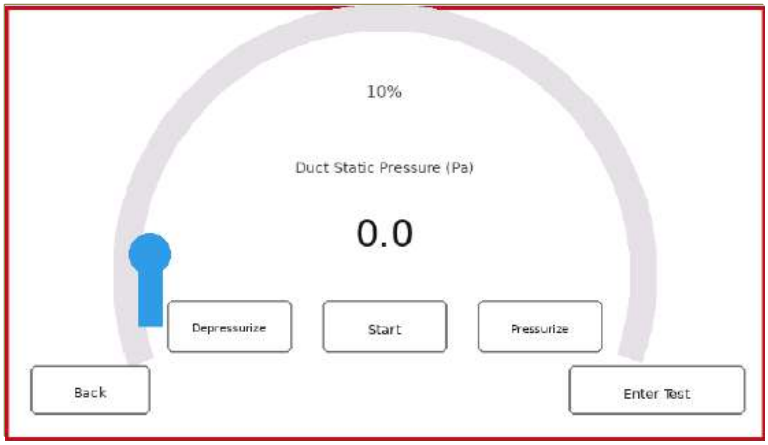
4.3.1 Set test parameters

1. Select a traffic tool
2. Click Next



4.3.2 Start adjusting the fan

1. Start adjusting the fan
2. Click "Enter the test"



4.3.3 Enter the test

The interface includes:

Real-time value display area
Set the parameter display area
Results show the area
Operation buttons

Click "Start" and test according to the set parameters

4.4 Result interface

[Click the "Results" button on the main interface to enter]

The serial number of the current display result is displayed in the upper right corner of the interface.

The parameters are displayed on the left and the result data is displayed on the right.

Click the arrow button below to switch to the previous or next result.

Click Delete to delete all results in segments.

After inserting the U disk, click "USB Export" to export to the U disk.

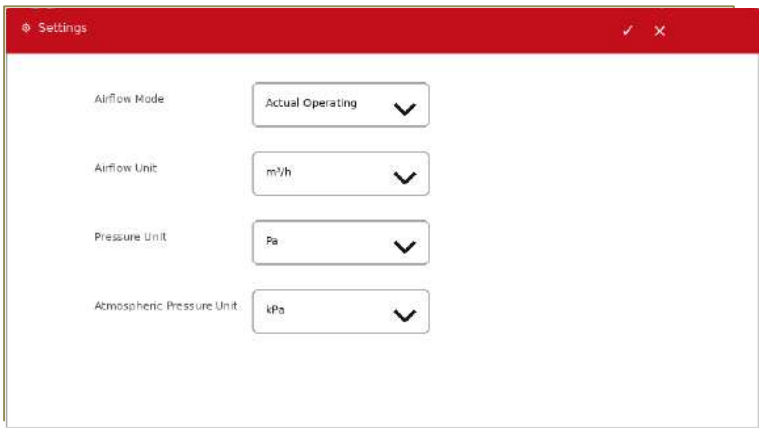
4.5 Set the interface

[Click the "Settings" button on the main interface to enter]
1. Airflow Mode:
Selectable between actual operating conditions and standard operating conditions
2. Unit Settings:

Airflow Unit

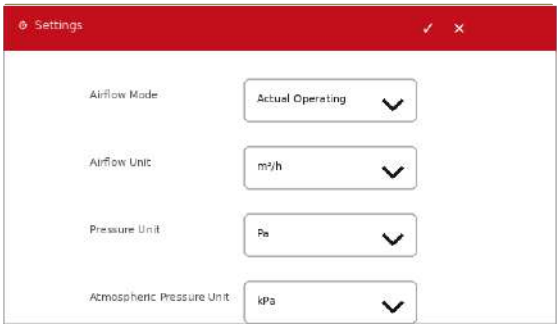
Pressure Unit

Atmospheric Pressure Unit



4.6 About

[Click the about icon in the upper left corner of the main interface to enter]



- System Settings
  Date and time Settings
  Language Settings
  Restore factory Settings (Restore factory Settings restores all test standards to their original state)

- Controller information
  View the information of this controller, such as serial number, motor type, etc.

4.7 calibration

Long press the area on the right of the title bar in the main interface, as shown in the blue box area below, and a password input box will pop up. After entering the correct password, click OK to enter the calibration interface.

Precautions

1. Please power the product within the permissible voltage range.
2. The screen of this product is made of glass; please avoid scratches or impacts.
3. Do not operate the touchscreen with sharp objects to avoid malfunctions or unresponsiveness.
4. Ensure proper ventilation and heat dissipation during installation, and avoid direct contact with heat sources.
5. Keep the product away from water. If water accidentally gets into the product, disconnect the power immediately.
6. When not in use for extended periods, disconnect the power and keep the product dry.
7. Do not disassemble or replace parts without authorization from the manufacturer.
8. This product comes with a one-year warranty; free repairs are provided for non-human-caused damage.
9. For any questions or after-sales service, please contact our customer service department.

5 Common Faults and Troubleshooting Methods

No.	Fault phenomenon	reason	Solution
1	Control box does not start	No power supply connected	Check the power supply and wiring according to Chapter 4.1.
		Internal circuit malfunction	Please contact the manufacturer.
2	The motor does not start	Power phase loss	Check the power supply
		The motor control line is not connected or has poor contact.	Connect motor control cable
		The control box is malfunctioning.	Restart the control box. If the problem persists, contact the manufacturer.
3	Touch unavailable	External interference	Check for surrounding interference sources and restart the control box.
		Capacitive touchscreen is effective for finger touch	direct touch with fingers
		Touchscreen problem	Please contact the manufacturer.
4	Temperature display incorrect	The temperature wire is not connected or the wire is not making a good contact.	Connect temperature wires
5	Incorrect air volume display range	The data usage tool you set up is not compatible with the one you installed.	Reset or reinstall the data management tool
6	USB cannot export data	This USB drive is not supported.	Use a USB flash drive that supports the USB 2.0 protocol and FAT file format.
		After plugging in the USB drive, only one data export operation will be performed.	Please unplug and replug the USB drive to export the data again.

Appendix 1 Pipeline Inspection Standards

NO	Standard	Country	Description
1	BS EN 12237：2003	EU	Ventilation for buildings—Ductwork—Strength and leakage of circular sheet metal ducts.
2	BS EN 1507：2006	EU	Ventilation for buildings—Sheet metal air ducts with rectangular section—Requirements for strength and leakage.
3	DW/143	EU	HVAC—A practical guide to Ductwork leakage testing.
4	Eurovent 2/2	EU	Air leakage rate in sheet metal air distribution systems.
5	SMACNA HVAC Air Duct Leakage Test manual,First edition, 2012	US	Duct construction leakage classification,expected leakage rates for sealed and unsealed ductwork,duct leakage test procedures, recommendations on use of leakage testing,types of test apparatus and test setup and sample leakage analysis.
6	AABC	US	Associated Air Balance Council AABC Standard
7	GB50243：2003/2016	GB	Ventilation and Air Conditioning Engineering

1.EU Standards EN12237

Air Tightness Class	Air Leakage Limit (fmax)m³/s/m²	Static Pressure Limit(ps)Pa	
		Negative	Positive
A	$\frac{0.027 \times P_t^{0.65}}{1000}$	500	500
B	$\frac{0.009 \times P_t^{0.65}}{1000}$	750	1000
C	$\frac{0.003 \times P_t^{0.65}}{1000}$	750	2000
D	$\frac{0.001 \times P_t^{0.65}}{1000}$	750	2000

*Class D ductwork is only for special apparatus

2.EU Standards EN1507

Air Tightness Class	Air Leakage Limit(fmax) m³/s/m²	Static Pressure Limit (ps)Pa			
		Negative	Positive at pressure class		
			1	2	3
A	$\frac{0.027 \times P_t^{0.65}}{1000}$	200	400		
B	$\frac{0.009 \times P_t^{0.65}}{1000}$	500	400	1000	2000
C	$\frac{0.003 \times P_t^{0.65}}{1000}$	750	400	1000	2000
D*	$\frac{0.001 \times P_t^{0.65}}{1000}$	750	400	1000	2000

*Class D ductwork is only for special apparatus

3.EU Standards Dw/143

Duct Pressure Class	Static Pressure Limit		Maximum Air Velocity m/s	Air leakage limits l/s/m²
	Positive Pa	Negative Pa		
Low-pressure-Class A	500	500	10	$0.027 \times P_t^{0.65}$
Medium pressure-Class B	1000	750	20	$0.009 \times P_t^{0.65}$
High pressure-Class C	2000	750	40	0.003xp65

4.EU Standards Eurovent 2/2

Air Tightness Class	Air leakage limit(fmax)m³/s/m²
A	$\frac{0.027 \times P_t^{0.65}}{1000}$
B	$\frac{0.009 \times P_t^{0.65}}{1000}$
C	$\frac{0.003 \times P_t^{0.65}}{1000}$

5.US Standards SMACNA

Duct Class	1/2-,1-,2-inwg	3-inwg	4-,6-,10-inwg
Seal Class	C	B	A
Sealing Applicable	Transverse Joints Only	Transverse Joints and Seams	Joints,Seams and All Wall Penetrations
Leakage Class			
Rectangular Metal	16	∞	4
Round Metal	8	4	2

Maximum air leakage is then defined as

$F=CLP^{0}.65$

F = Maximum air leakage(cfm/100 ft2)

CL = Leakage class

P = Pressure (inwg)

6.US Standards AABC

No.	Type of System	Minimum Test Pressure	Maximum Allowable Leakage
1	Fractional horsepower fan system;fan coils,small exhaust/supply fans,and residential system	0.50"WC(125Pa)	2%
2	Small systems;split DX systems-usually systems under 2000 CFM(940l/s),and residential systems	1.00"WC(250Pa)	2%
3	VAV and CAV terminal boxes and associated downstream ductwork	1.00"WC(250Pa)	2%
4	Single zone,multi-zone,return ducts,and exhaust duct systems	2.00"WC(500Pa)	2%

5	Chilled-beam primary supply	2.00'WC(500Pa)	1%
6	All ducts in chases and concealed spaces man return ducts on VAV and CAV systems,main ducts on general exhaust or outside air systems	3.00'WC(745Pa)	1%
7	VAV and CAV terminal boxes tested with upstream ductwork	4.00"WC(995Pa)	1%
8	Supply ducts for VAV and CAV systems	4.00'WC(995Pa)	1%
9	Dual duct systems,both hot duct and cold duct	6.00"WC(1495Pa)	1%
10	High pressure induction system	6.00"WC(1495Pa)	0.5%
11	Exhaust systems for labs with air valves	6.00"WC(1495Pa)	0.5%
12	Grease duct Systems	4.00'WC(995Pa)	0.0%
13	Supply,return,and exhaust ductwork located outdoors	3.00'WC(745Pa)	1%

Determine the total allowable leakage of each duct system,including the allowed leakage rate of each component.If the entire duct system cannot be tested,determine the allowed leakage rate in a section of duct. To do this,determine the surface area of the total duct system,and the surface area of each section of the system to be tested.

Tested section air fow rate =Surface area of tested section/Surface area of duct work in entire system ×Total system operating air flow rate
Allowable leakage airflow rate for tested section=Tested section air flow rate ×Allowable percentleakge

7.GB Standard GB50243

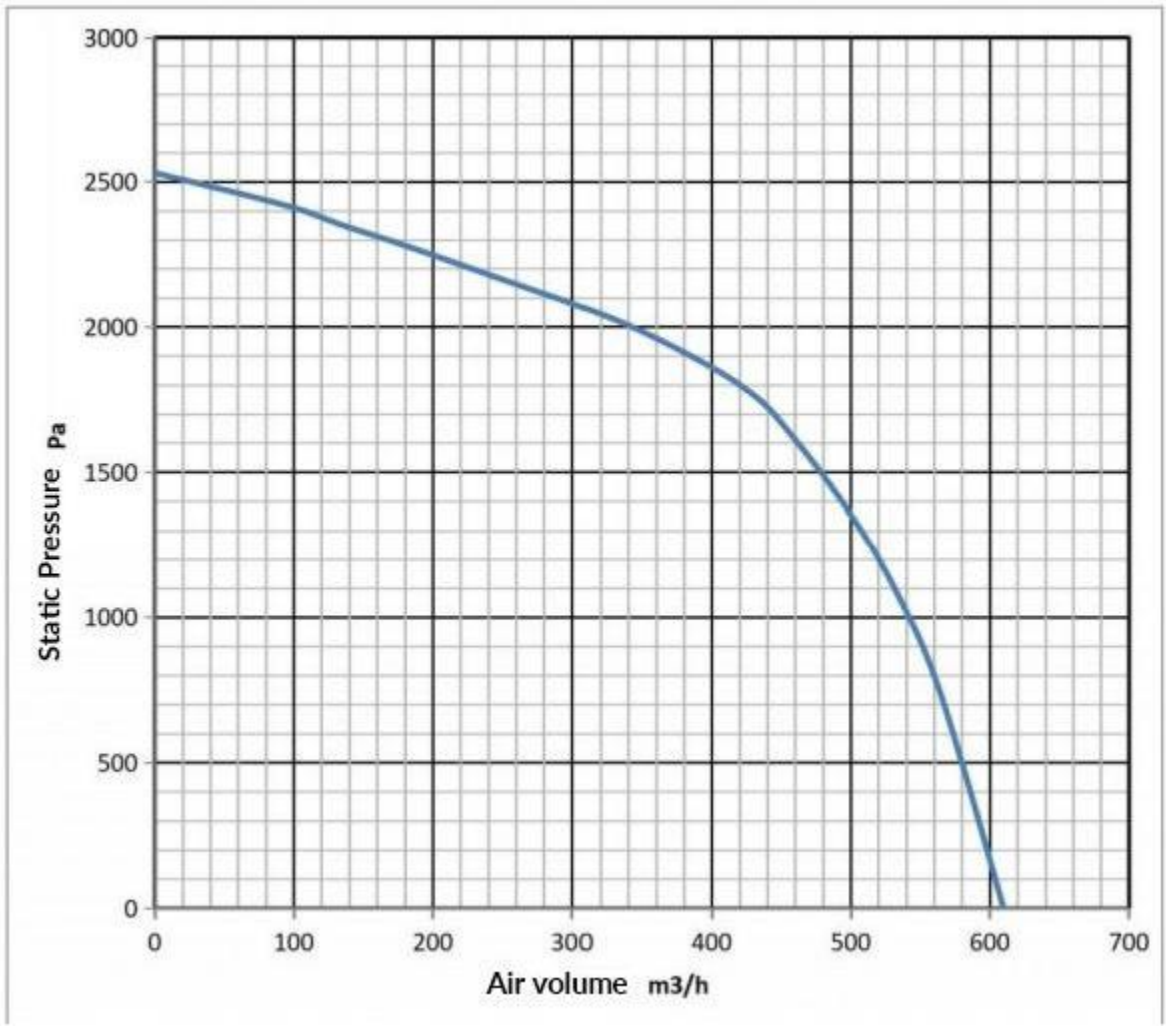
Rectangular duct pressure class	Maximum leakage rate $m^3/h/m^2$
low voltage system	$0.1056\times P^{0}.65$
medium voltage system	$0.0352\times P0.65$
High voltage system	$0.0117\times P0.65$

P -- refers to the working pressure (Pa) of the duct system.
1. The allowable air leakage of low-pressure and medium-pressure circular metal ducts, composite material ducts, and non-metallic ducts using non-flange construction should be 50% of the specified value for rectangular ducts.

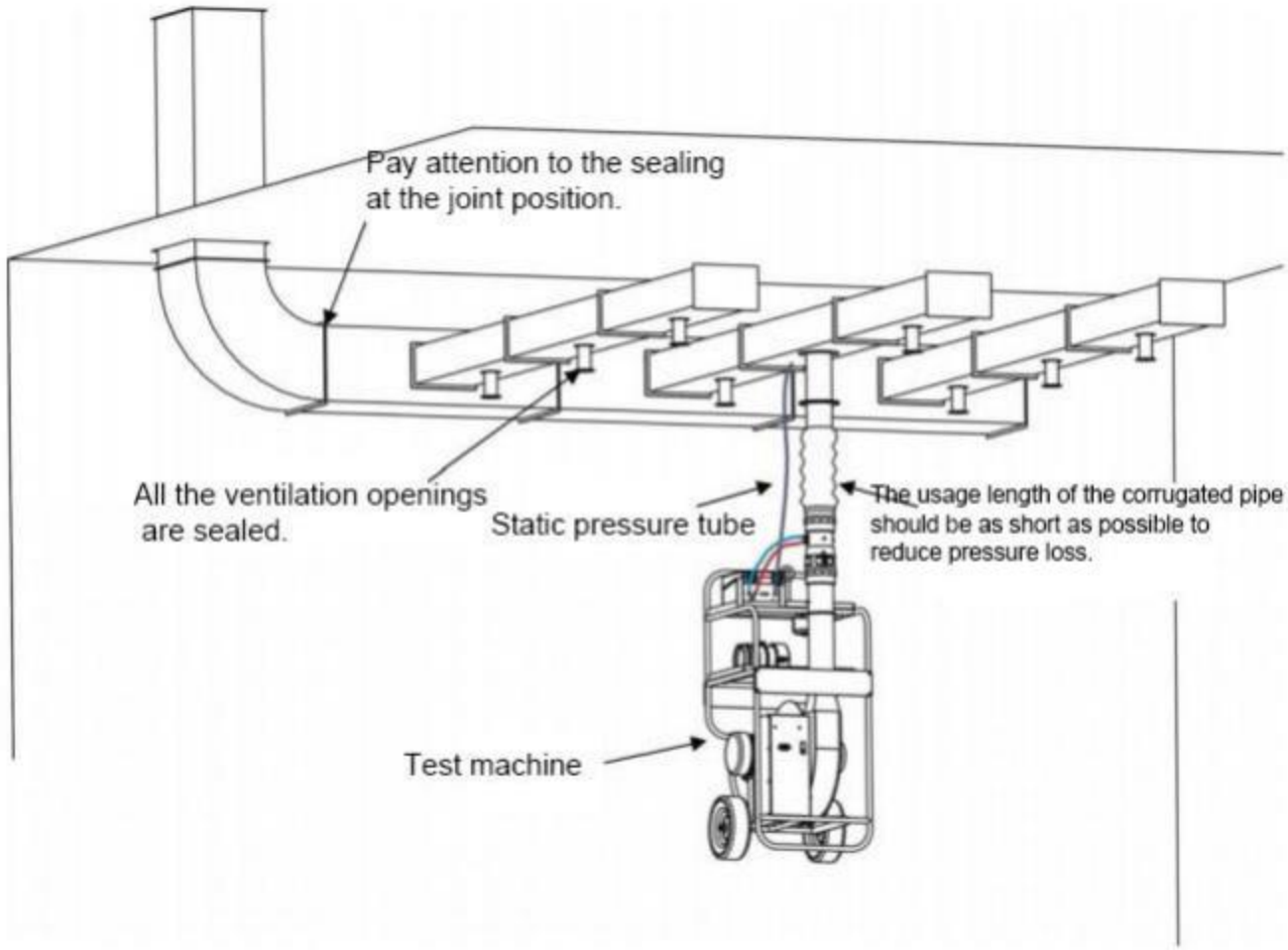
2. The allowable air leakage of brick-concrete ducts should not exceed 1.5 times the specified value for rectangular low-pressure system ducts.

3. Smoke exhaust, dust removal, and low-temperature air supply systems should follow the regulations for medium-pressure system ducts; air conditioning systems of levels 1-5 should follow the regulations for high-pressure system ducts.

Appendix 2 Fan Performance Curves



Appendix 3 Installation Diagram



Leak Locator

1. Visual Inspection: Observe the seals of all vents and pipe joints.

2. Listen for noticeable drafts during pressurization; larger leaks will produce a distinct hissing sound.

3. Sensing: Place your hand near the pipe surface; you should feel airflow at the leak.

4. Soapy Water: Apply soapy water to the pipe joints and observe for bubbles.

5. Smoke Pen: Light a smoke pen and place it inside the pipe; smoke will appear at the leak.